EXHIBIT 5

EXPERT REPORT OF DR. MICHAELA ALMGREN

I. Background and Qualifications

1. I am a Clinical Assistant Professor in the Department of Clinical Pharmacy and Outcomes Sciences at the University of South Carolina College of Pharmacy. I teach principles of sterile compounding per United States Pharmacopeia ("USP") Chapters 797 and 800, aseptic technique and pharmacy regulations applicable in a compounding environment run under 503B of the Drug Quality and Security Act of 2013, as well as pharmacokinetics and biopharmaceutics courses. I specialize in sterile compounding, medication safety, and pharmacy laws and regulations that relate to pharmacy compounding practices. I also provide continuing education courses for pharmacists in those topics. I received my Doctor of Pharmacy degree from the University of South Carolina College of Pharmacy in 2010. Additionally, I have a Master's Degree in Pharmaceutical Chemistry from the University of Florida.

2. In conjunction with my academic appointment, I currently maintain a practice site at a 503B outsourcing pharmacy where I perform duties of outsourcing pharmacist, clinical advisor, and pharmacy student preceptor. Previously, I worked in pharmacy operations in a large teaching hospital as a pharmacist. I have almost 15 years of experience in sterile compounding and aseptic technique. Prior to joining the faculty at the University of South Carolina, I worked for several years in pharmaceutical manufacturing where I was involved in drug formulation, quality assurance, quality control, and analytical method development. My professional qualifications are Doctor of Pharmacy and Master of Science in Pharmacy with a focus on Pharmaceutical Chemistry. A copy of my Curriculum Vitae is attached as Exhibit A.

3. In the last 4 years, I have provided testimony at trial or by deposition in the following cases:

- *In the Matter of the Federal Bureau of Prisons' Execution Protocol Cases*, No. 19-mc-0145, (District of Columbia);
- *Swearingen v. Davis*, 19-cv-03079, (S.D. Texas); and
- *Pizzuto v. Tewalt, et al.*, 20-cv-00114 (Idaho).

4. I am not now, nor have I ever been, regularly employed by any legal firm or entity, nor do I derive a significant portion of my income from expert witness activities. My fee schedule for this case is:

Review of medical records or other materials provided by Client: $400/hr
Phone conference, reference research, report preparation: $400/hr
Testimony, including deposition: $400/hr

II. Materials Relied Upon.

5. The attorneys who represent death-sentenced prisoner Terry Lynn King asked me to submit an expert medical and scientific opinion based on the documentation provided to me about whether the use of the three-drug protocol, and in particular compounded medications, can cause a risk of harm and unnecessary suffering.

6. Mr. King's attorneys provided me with the following documents:

a. The Tennessee Department of Correction Lethal Injection Execution Manual – Execution Procedures for Lethal Injection ("the Protocol");

b. Depositions of the Drug Procurer, Executioner, Pharmacist, Warden Tony Mays, Associate Warden Ernest Lewis, Pharmacy Owner, IV Team Member 1, IV Team Member 2, IV Team Member 3, Commissioner Tony Parker in both his individual capacity and as an official designee of the Tennessee Department of Correction ("TDOC"), Debbie Inglis, Physician, EMT 1, EMT 2, and EMT 3;

c. Laboratory reports for compounded drugs;

d. Midazolam storage and preparation instructions;

e. Potassium Chloride preparation instructions;

f. Handwritten inventory list; and

g. Prescriptions and a sample prescription for lethal injection chemicals.

7. Where necessary, I have consulted the records listed above. More documents, studies, and other pertinent information may become available to me at a later date, and I reserve the right to take such materials into account and to modify or supplement my opinions accordingly. I may also be present at hearings or at trial and may take into account any testimony or other evidence related to my opinions and modify/supplement my opinions accordingly.

III. Standards governing the preparation of compounded medications and medication storage and handling.

8. The Protocol allows for use of lethal injection chemicals ("LICs") that are either commercially available or compounded according to USP standards and guidelines. (Protocol p. 34). According to the records I reviewed, TDOC procures midazolam and potassium chloride from a compounding pharmacy that compounded these products and procures vecuronium from the same compounding pharmacy in a commercially manufactured form, though it still must be reconstituted for use.

9. When drugs are manufactured, they undergo extensive quality control testing which assures that they maintain their quality, such as potency and purity up to their expiration date. Stability studies determine if there are any concerns with drug deterioration. These medications are tested (for important attributes such as assay, potency impurities, content uniformity, and other attributes that are product specific and typically defined for each product in the USP Compendium for each individual drug) multiple times during the manufacturing process and again when completed and prior to sale. They have stability data showing that they do not degrade before their expiration and their storage container as well as

the container closure undergoes extensive integrity testing. Additionally, if these medications are sterile, they undergo extensive sterility testing.

10. When medications are compounded, Active Pharmaceutical Ingredients or "APIs" may be used to prepare them. The compounding is usually done in a pharmacy. Sterile compounding can be done in a Biological Safety Cabinet or Laminar Airflow Hood and it must follow the strict guidelines of USP Chapter 797. USP Chapter 797 describes best practices to follow in order to prepare the product aseptically and to keep it sterile, how to sterilize it, how to maintain the compounding environment free from contamination, how to perform training assessments, how to determine BUDs of sterile compounded products, etc. BUD refers to Beyond Use Date, or expiry of the compounded product. Since compounded products do not undergo as extensive quality testing as commercially available products, their expiry or BUD is significantly shorter. The APIs used are typically not sterile and the product has to be sterilized at the end of compounding. It is important to use the APIs from sources that guarantee high quality and offer USP or pharmaceutical grade APIs, as those are most likely to meet all USP standards.

11. USP is a compendium of quality requirements, quality specifications, practices, and guidelines to achieve the highest pharmaceutical quality for pharmacy practice as well as the pharmaceutical industry. Chapters 1 through 999 are enforceable by the Federal Drug Administration. A compounding pharmacist should be very familiar with USP 797 guidelines in order to prepare safe and effective sterile compounded products. If USP Chapter 797 guidance is not followed it can lead to medication contamination which will cause patient harm and unpredictable drug effects.

IV. Unqualified personnel perform tasks in the Protocol that should be done by professionals with much more extensive training and education in pharmacy related issues.

12. The selection process for the extremely crucial positions of "drug procurer" and "executioner" per the Protocol is not adequate, authorizing team members who have insufficient medical training to handle lethal injection chemicals without really understanding the procedures.

13. The drug procurer lacks the training and professional qualifications necessary to understand how to properly store and handle LICs. Additionally, the drug procurer does not understand the differences between reagent chemical and USP grade APIs, regulations surrounding the drug procurement of controlled substances, drug substitution process, how to determine the amounts of drugs needed, or the importance of careful documentation and drug beyond use dating ("BUD") assignment. This is a highly specialized position that should be held by a person with in-depth training in the listed areas, such as a pharmacist.

14. Furthermore, the drug procurer lacks attention to detail. For example, the drug procurer testified that he believed that an entry regarding the size of a midazolam vial that he made in the drug inventory log was "not accurate." (Drug Procurer Dep. 299-301). There are other examples throughout his deposition that demonstrate a lack of understanding of the importance of details when it comes to handling of LICs. This leads to a potential for the drug procurer to order the incorrect amount or concentration of LICs or use expired LICs.

15. The role of executioner is one of the most crucial roles during the administration of lethal injection. This position should be assigned to a person with medical or pharmacy training who is able to prepare medications correctly, can verify that the instructions provided are correct, is aware of proper aseptic technique, and knows how to determine the correct rate of drug administration.

16. The executioner does not follow USP Chapter 797 guidance on BUD assignment for all three of the LICs. Pursuant to USP chapter 797, once a medication is pulled up into a syringe in a non-sterile, non-ISO class 5 laminar airflow hood preparation area (for example on the counter, or at bedside), it is considered "Immediate-Use Compounded Sterile Product" and must be used within one hour or discarded. Medications that are not used within one hour of preparation may become contaminated and thus ineffective. They should not be used past one hour and should be discarded as they are considered expired. (USP/NF 2021 Issue 2, Chapter 797). The executioner testified that he only applies this rule to midazolam, but not the other two medications. (Executioner Dep. 176-177, 255-258). The executioner testified that he did not know the BUD for either the vecuronium bromide or the potassium chloride but that he believed the one-hour restriction only applied to the midazolam. (*Id.*) It is clear that the executioner does not know what USP Chapter 797 requires. Over two hours lapsed between the time that the executioner prepared and administered the potassium chloride syringes and vecuronium bromide syringes during the Donnie Johnson and Billy Ray Irick executions. (Def. Int. Discl. 963, 965, 827, and 831). These drugs were expired under Chapter 797.

17. The executioner does not have any special or advanced aseptic technique training. (Executioner Dep. 159-160). The executioner's experience preparing vaccines for farm animals 25 years ago, (Executioner Dep. 21-22), obviously does not equate to the intricacy of drug preparation and reconstitution needed to carry out the Protocol correctly.

18. The executioner's description of how vecuronium bromide is reconstituted (Executioner Dep. 146-147) shows that he has not been adequately trained to properly prepare the LICs. When liquid is added to a vial for reconstitution, the same amount of air as the liquid that was added to the vial should be removed. Otherwise, the pressure in the vial is higher than the pressure on the outside, leading to a portion of the drug being expelled out of the vial.

Though the amount of the drug spillage may appear to be small and insignificant to somebody without proper medical training, this can impact the total dose of the drug given and thus not the full amount of the drug will be applied.

19. When asked about aseptic technique, the executioner describes how he "cleans the needle." (Executioner Dep. 159:24). This is completely inappropriate and incorrect aseptic technique and violates USP 797 regulations. The needle is sterile when taken out of the package and should not be touched under any circumstances. USP Chapter 797 states: "Protection of critical sites by precluding physical contact and airborne contamination shall be given the highest priority in sterile compounding practice."

20. The hub of the needle as well as the needle itself are critical sites and, if touched, the needle should be discarded. This is clear evidence that the executioner is not competent at preparing the LICs for execution.

21. Furthermore, it is concerning that the executioner's drug preparation process is overseen only by another unqualified IV Team member with inadequate pharmacy training. (Warden Dep. 213). The IV Team member does not observe the Executioner's drug preparation activities closely for compliance with the preparation instructions and, therefore, will not be able to determine if the procedures are followed correctly. This can lead to potential errors in preparation of the LICs.

22. The executioner is not aware that the LICs may fall out of solution or that the color of the drug may change. (Executioner Dep. 178:2). Any change in color of a compounded drug is a concern, as these changes usually signal some type of change in the drug quality. The executioner also stated that "the color of the drug is not a large focus of mine." (Executioner Dep. 145:5-7). This is concerning as visual inspection of each injectable drug must be performed as per USP Chapter 790 to assure that each chemical is completely dissolved and safe to use. Typically, visual inspection is performed by a healthcare professional using a

black and white background and examining the final product for 5 seconds against each background after the prepared injectable is gently swirled or inverted. (USP Chapter 790 2021 vol. 2). The absence of this procedure during the executioner's sterile drug preparation activities is very concerning, as there have been issues with the potassium chloride prepared for TDOC falling out of solution. (Procurer Dep. 246:12-16; Pharmacist Dep. 132:1-4). If the drug precipitates, it can lose its potency. The precipitation itself is also harmful and if injected intravenously can cause severe pain and occlusion of the blood vessels, potentially causing pain and suffering.

V. The instructions for Lethal Injection Chemicals preparation are not detailed and specific enough and may result in in the administration of the wrong dose.

23. As stated by the executioner, the instructions for reconstitution and drug preparation are not standardized, are typically provided by the pharmacy, and may change at any time. (Executioner Dep. 114:14-24). Supposedly, the instructions that come with the medication vials are only for those specific vials of drugs provided. This is concerning, as it can lead to medication errors should previous or incorrect instructions be used in drug preparation. Unfortunately, the executioner would not be able to determine whether the instructions are appropriate.

24. The Protocol also provides some general instructions for the preparation of the two sets of syringes (Protocol p. 39-40) but depending on the LICs supplied (for example compounded versus commercially available), the procedure may be completely different and potentially incorrect for any but the intended syringes.

25. Since the executioner lacks any significant medical training and does not understand the proper dosing or mechanism of action of each drug used, the executioner is not able to determine if the preparation instructions match the dosing called for in the Protocol.

This is concerning because the wrong instructions for sterile drug preparation could be applied, leading to an incorrect dose being administered.

VI. The procedures described in the Protocol are not being followed as written, which can lead to many potential errors.

26. The Protocol mandates that "the LIC on hand is monitored for expiration dates" and "As the LIC reaches its expiration date, it shall be disposed of by hazardous waste pick-up." (Protocol p. 35). This procedure is not being followed, as stated during the deposition of the drug procurer. (Procurer Dep. 287:4-13, 289:10-22). According to the drug procurer, at the time of his deposition, TDOC had in its possession LIC that expired over three years ago. (*Id.*) This is a rather concerning practice as this can lead to accidental use of out-of-date LIC which may cause unpredictable effects.

27. It appears that expired LIC may have been used in a previous execution. The drug procurer testified that, based on a log prepared by the pharmacy, there was no unexpired midazolam in TDOC's possession between May 1, 2019 and July 16, 2019. (Procurer Dep. 138-140). However, Donnie Johnson was executed on May 16, 2019. The reasoning that the drug procurer provided for use of this drug during this time was that he followed the USP BUD date rather that the BUD assigned by the pharmacist in the database. (Procurer Dep. 141:16-142:8). Again, this is against the dictates of USP, as the drug procurer must always follow the BUD assigned by the pharmacist, superseding USP guidance. When drugs are compounded, oftentimes excipients are added for a variety of reasons such as pH adjustment, buffering, etc. The expiration of the compounded product according to USP 797 will be either 45 days, if kept in a solid, frozen state, or if the API or any other ingredients have an expiration date that is earlier than 45 days, the expiry date supersedes the BUD, and the compound must be assigned the shortest date. Thus, the pharmacist-assigned BUD should have been followed. This means that the midazolam used in Donnie Johnson's execution may have been expired. Since the drug procurer is unaware of this issue, there is potential for use of expired drugs in future

executions. The pharmacist assigned expiry or BUD must be followed, otherwise the quality and effectiveness of the compounded drug will be impacted negatively with unpredictable outcomes.

VII. Questionable lethal injection chemical shipping and storage conditions.

28. The LIC storage conditions are not being monitored regularly, (Procurer Dep. 297-298), thus there is no guarantee that the compounded medications have been stored as required per USP Chapters 797 and 659 (between -25 and -10 degrees Celsius or -13 to 14 degrees Fahrenheit). Looking at the inventory logs, the temperature in the storage areas seems to vary greatly. It is important to monitor temperature regularly to assure that the LICs are stored in acceptable temperature ranges at all times. USP Chapter 797 specifies that the temperatures should be checked at least once daily and documented on a temperature log.

29. In the Protocol, there is no mention of maintaining the storage areas for LICs at proper temperatures, and what those temperatures need to be. USP Chapter 659 provides guidance on the temperature at which compounded mediations should be stored. USP Chapter 1079 states that the temperature of the storage freezer should be monitored regularly, typically on 24-hour basis using a temperature monitoring system, to ensure that the temperature does not deviate outside of the specified range. If the medication is not stored properly, this can lead to changes in the drug quality and potency, leading to changes in the drug activity. Drugs exposed to temperatures outside of the acceptable and specified ranges can become damaged, unusable, and unsafe as the temperature and humidity may vary greatly in unmonitored spaces throughout the year. These medications are compromised and should not be used due to the unpredictable nature of the degradation process when temperature is not monitored continuously.

30. The drug procurer appears to be unaware of the regulations pertaining to storage temperature requirements as per USP regulations. (Procurer Dep. 293-294). Thus, there are no policies in place for temperature monitoring.

31. While the compounded drugs are being shipped, their temperature is likewise not being properly monitored. The pharmacist stated that there is a temperature monitoring indicator included in the packaging of the shipped drugs, (Pharmacist Dep. 88:1-4, 177:9-16), however the drug procurer is not even aware that the packaging contained such an indicator, let alone the significance of this indicator, or how to read it to verify whether the drugs have been stored correctly and within the acceptable temperature range during shipping. (Procurer Dep. 304:12-17). Since temperatures during shipping can vary greatly throughout the year, the first step should always be to check the medication upon arrival. Medications exposed to temperatures outside of acceptable range should not be used and be promptly disposed of.

32. Typically, in a pharmacy, a temperature log for each room, refrigerator, and freezer is maintained to show compliance with storage temperature requirements. Temperature is checked daily, or as required based on a product's labelling, to ensure correct storage and drug quality. Any excursions outside of the required temperature range are recorded and must be explained. An assessment is then performed on products that were exposed to suboptimal storage conditions to determine whether they should be used or discarded. None of that is done at TDOC storage facility for LICs.

VIII. The majority of analytical reports for compounded medications are not in compliance with USP requirements as per current USP Compendium. There does not appear to be adequate action taken by the pharmacist, drug procurer, or any other TDOC member to address this issue.

33. To assess whether the compounded drugs are meeting quality requirements, they should be tested according to the USP Monograph specific for the product. The tests are listed in the USP Compendium and provide guidance on how to perform the testing as well. These test requirements are extremely important as they define crucial parameters such as

assay limits and sterility requirements. Assay testing shows the amount of active ingredient in the formulation. Low assay results mean that the drug contains subtherapeutic levels of active ingredient. Sterility testing confirms that the drug is sterile. Endotoxin testing determines the amounts of endotoxin present in the drug. The presence of impurities will impact potency of the drug and, depending on the type of impurities present, it may also impact the pharmacological activity of a drug. If a drug fails any of the specified quality testing it should not be used because the quality of the drug may be subpar and pharmacological activity is not predictable. Instead, it should be investigated to determine why the failure in quality occurred. This is another reason why the APIs and their sources should be carefully considered and selected.

34. The laboratory testing performed for midazolam should follow USP monograph for midazolam injection. The tests as required and specified by USP for midazolam are:

a. Assay, acceptance criteria 90.0% -110.0%;

b. Impurities, acceptance criteria: Individual known impurity not more than 0.5%, Individual unknown impurity not more than 0.1%, Total Impurities not more than 1.0%;

c. Particulate Matter in Injections per USP 790: no particles allowed for IV preparations;

d. Bacterial Endotoxins test, limit not more than 8.33 USP Endotoxin Units per mg;

e. pH: 2.5-3.7;

f. Sterility testing per USP 71: must pass.

35. I have reviewed the available laboratory testing results for the midazolam that the pharmacy prepared for TDOC. According to the laboratory testing data provided:

- Midazolam sample submitted on 9/22/2018 was tested only for assay (94.2%) and sterility (Pass), thus not meeting all quality requirements. No other results are available for review. (Def. 2nd Int. & RFP & RFA 000086).
- Midazolam sample received on 11/13/2019 was tested for assay and FAILED (114%) with assay value being outside of acceptance criteria. Only assay and sterility (Pass) testing was performed by the lab. No other results are available for review. (Def. 2nd Int. & RFP & RFA 000090).
- Midazolam tested on 5/22/2018 was tested for sterility only (Pass). No other results are available for review. (Def. 2nd Int. & RFP & RFA 000092).
- Midazolam received 5/10/2018 was tested for assay (97%), sterility, endotoxins container closure integrity only. No other results are available for review. (Def. 2nd Int. & RFP & RFA 000093).
- Midazolam received 4/25/2019 was tested for assay (104%) and sterility only (Pass). No other results are available for review. (Def. 2nd Int. & RFP & RFA 000096).
- Midazolam received 7/16/2019 was tested for assay (92.4%) and sterility (Pass) only. No other results are available for review. (Def. 2nd Int. & RFP & RFA 000099)..
- Midazolam received 11/22/2019 was tested for assay (98.6%) and sterility result was not reported (TBD listed in the records). No other results are available for review. (Def. 2nd Int. & RFP & RFA 000103).

36. None of these compounded preparations of midazolam meet all USP quality standards because, based on the available documentation, not all of the tests required by USP have been performed or results reported. The quality of the compounded midazolam cannot be verified as not all attributes of the preparations were tested.

37. The laboratory testing performed for potassium chloride should follow USP monograph for potassium chloride injection. The tests as required and specified by USP are:

a. Identification, acceptance criteria: Pass;

b. Assay, acceptance criteria: 95.0% to 105.0%;

c. Bacterial Endotoxins test limit: not more than 8.80 USP Endotoxin Units per mEq;

d. pH between 4.0 and 8.0;

e. Particulate Matter in Injections per USP 790: no particles allowed for IV preparations.

38. I have reviewed the available laboratory testing results for the potassium chloride that the pharmacy prepared for TDOC. According to the laboratory testing data provided:

- Potassium chloride submitted 7/16/2019 was tested for assay (FAILED with potency of 112%) and sterility (passed). (Def. 2nd Int. & RFP & RFA 000087).
- Potassium chloride received 8/6/2019 was tested for assay and FAILED with potency of 94.0%. (Def. 2nd Int. & RFP & RFA 000088).
- Potassium chloride tested on 7/31/2019 USP 71 sterility testing (Passed). (Def. 2nd Int. & RFP & RFA 000101).

39. Each of these compounded preparations of potassium chloride fails to meet all USP quality standards as not every test required by USP has been performed. Additionally, ALL of the samples tested for potency failed and it is not clear how or if this issue has been resolved. The quality of the compounded drug cannot be verified as not all attributes of this drug have been tested.

40. It is important to test for impurities in midazolam as the impurities can impact pharmacokinetic and pharmacodynamic outcomes. This testing was not done on any of the midazolam samples tested.

41. It is rather concerning that the compounded drugs have failed the testing, and that some of the tests were either not performed or performed in-house but not reported for review.

42. Although the pharmacist testified that they did perform visual inspection at the time of compounding, the reports do not indicate this. Additionally, visual inspection should be done also just prior to the administration by the executioner, as the drugs may have fallen out of solution during storage, transport, or preparation, especially after undergoing prolonged frozen state and the thawing process.

43. The fact that potassium chloride reports show that every single sample reported failed the potency (assay) test shows that the pharmacy's compounding methodology is poor, and the pharmacy is not able to prepare this product in compliance with USP standards. Medications with incorrect potency will have an unpredictable effect when used. The medication may be super potent or subpotent and should not be used.

44. Another important consideration is the fact that it does not appear that the missing and failing analytical results triggered adequate corrective action from the pharmacist or TDOC. According to the Protocol, a member of the Execution Team is to check the concentration (analytical results) of the LICs. (Protocol p. 37). However, this is either not done, or if this is performed, the person is not qualified to do so. This is a very significant concern, since the drugs TDOC has procured for use in executions may have quality issues.

IX. Compounding logs and facility records are necessary to ascertain whether the Pharmacy is meeting quality requirements.

45. In general, compounding logs must be maintained by the compounding pharmacy to ensure the traceability and quality of the compounded product. This information

should include information regarding the preparation of the potassium chloride and midazolam, Certificates of Analysis for all APIs and excipients, pharmacy training documentation (such as sterile glove fingertip testing and media fill testing) of the compounding personnel, including the pharmacy technician preparing the medications, records showing whether the compounding facility meets environmental monitoring requirements, as well as equipment calibration logs for the balances, pH meters, and any other equipment used.

46. This documentation is an important practice recommended by the American Society of Health-System Pharmacists and required by USP Chapter 797. The Tennessee Board of Pharmacy also requires compounding pharmacies to keep detailed logs. Rules of the Tennessee Board of Pharmacy Chapter 1140-07-.02.

47. Compounding logs must typically include the criteria used to determine the BUD, a master formulation worksheet containing storage requirements and documentation of performance of quality control procedures. Without access to these logs, it is not possible to verify that the drugs are properly prepared and can be used without causing unnecessary suffering to the prisoner.

48. No pharmacy compounding records were submitted to be reviewed. Thus, it is not possible to verify that LICs provided to TDOC were properly compounded. It is important that the pharmacy records be available for review to ensure that the pharmacy compounding these preparations uses proper reagents and APIs, uses correct formulas to compound, has sterile compounding facilities meeting quality requirements, and has personnel training requirements as well as the equipment necessary to prepare these compounds.

Michaela M. Almgren

Michaela Almgren, PharmD, MS

November 17, 2021

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EDUCATION

Doctor of Pharmacy, 2010 *Magna Cum Laude*
South Carolina College of Pharmacy, University of South Carolina, Columbia, SC

Master of Science in Pharmacy, 2010 *Magna Cum Laude*
Pharmaceutical Chemistry (Industrial Pharmacy focus)
University of Florida, Gainesville, FL

Bachelor of Science, 1997 *Magna Cum Laude, Graduated with Honors*
Major: Biology, Chemistry
Columbia College of South Carolina, Columbia, SC

EMPLOYMENT HISTORY AND EXPERIENCE

Clinical Assistant Professor
University of South Carolina, College of Pharmacy, Columbia, SC
August 2013 – present

- Teach pharmacology, pharmacokinetics and biopharmaceutics lectures.
- Teach pharmacy law (South Carolina state law, Federal law) and ethics lectures and moderate in-class discussions.
- Lecture at USC School of Medicine on pain management pharmacology, opioid and non-opioid as well as multimodal analgesia.
- As a former Institutional Lab Course coordinator taught basic and advanced institutional pharmacy practice focused laboratory courses with focus on sterile compounding and aseptic technique to students in the second year of pharmacy education. Typical class size is 110 students.
- Developed, completely designed and implemented training course content for basic sterile compounding training with focus on USP chapters 797 and 800, and introduction to current institutional pharmacy practice.
- Developed and implemented 6-hour module for student training in 503A versus 503B environment regulations to emphasize critical differences in cGMP (per 21 CFR 210 and 211) versus USP standard requirements.
- Implemented practical assessment criteria for student competency of performing basic sterile compounding procedures according to USP 797 and 800 guidelines to demonstrate and document preparedness for IPPEs and APPEs.

- Revised course content and objectives for the laboratories to meet the ASHP-ACPE Task Force guidelines for entry-level competencies needed for pharmacy practice in hospital and health-systems.
- Enhanced and updated the content of advanced sterile compounding course PHMY 791, including TPN compounding, neonatal TPN formulation and compounding, chemotherapy and hazardous drug compounding, and IV access line introduction and maintenance.
- Introduced hazardous drug handling guidelines and USP 800, with emphasis on student training in utilization of all closed system transfer devices currently available in the U.S.
- Provided competency testing and certification for students to be able to participate in institutional pharmacy practice site sterile compounding activities (media fill testing, fingertip testing).
- Consulting pharmacist, performing duties of a permit holder (Non-dispensing pharmacy permit # 4956) and fully responsible for maintaining the facility, inventory control and daily operations.
- Mentor students in research offering variety of independent study projects.
- Clinical seminar evaluator and student advisor.
- Developed and implemented ACPE accredited course titled *Basic Aseptic Technique* for Kennedy Pharmacy Innovation Center, offering pharmacists and pharmacy technicians 23.5 hours of continuing education credit composed of two-day live hands-on course as well as home study.

Outsourcing Pharmacist and Clinical Specialist
Preceptor for University of South Carolina College of Pharmacy APPE Program
Nephron Pharmaceuticals Company, West Columbia SC
September 2018 - present

- Lead number of innovative and research-oriented projects (Yaskawa, Straubli, SteraMist) for manufacturing and outsourcing facility.
- Oversee formulation and filling operations for 503B outsourcing pharmacy.
- Perform product development including scale-ups for product development for outsourcing pharmacy.
- Develop new standard operating procedures and train staff as needed.
- Provide research information about new products, develop support materials for marketing purposes.
- Developed and maintain APPE site for 4th year pharmacy students.
- ACTO app (training platform for sales force) management—review of content, provide training information about products.
- Assist with FDA quality inquiry investigations and management.
- Provide information for product development and production planning.
- Provide important information on labeling guidance for new products.
- Provide DocMatter clinician Q and A website support.
- Training of sales force via live lectures, seminars and pre-recorded lectures.

Hospital Pharmacist
Palmetto Health Richland Hospital Pharmacy, Columbia SC
August 2013 – September 2018

- Performed duties of staff pharmacist—review orders, medication utilization review, order entry.
- Preparation and checking of sterile and non-sterile medication compounds.
- Medication history pharmacist—collect medication history via patient interviews, perform

medication reconciliation, clinical consultations, patient education, medication use evaluation, and medication history consults.
- Maintained USC college of pharmacy practice site.

Assistant Professor of Clinical and Pharmaceutical Sciences
South University School of Pharmacy, Columbia, SC
May 2010 -- August 2013

- Taught lectures in large number of courses in pharmaceutical sciences as well as pharmacy practice in distance education setting, managing two classrooms and collaborating with faculty members located in Savannah, GA. Typical class size was 80 students in the Columbia campus classroom, with 90 additional students at the distant site in Savannah.
- Completely redesigned Pharmaceutical Calculations course structure to flipped classroom model in order to increase effectiveness of teaching, significantly reducing the number of students needing remediation and improving overall test scores in the capstone course.
- Applied several active learning teaching techniques and team-based learning to traditionally taught courses to enhance student learning.
- Developed laboratory exercises to increase student understanding by applying learned material to practice using hands-on experiments.
- Developed and delivered elective course on animal envenomation pharmacology, medicinal chemistry and drug management.
- Taught majority of hospital-related lab coursework including TPN compounding, IV and chemotherapy preparation, and USP<797> training.
- Provided competency testing and certification for students to be able to participate in institutional pharmacy practice site sterile compounding activities (media fill testing, fingertip testing).
- Evaluated student performance of Objectively Structured Clinical Examination (OSCEs).
- Provided APhA certified immunization training for pharmacy students.
- Initiated student chapter of Student Society of Health Systems Pharmacists and guided students to the ASHP national recognition of the chapter.
- Served as faculty advisor for Rho Chi chapter.
- Academic advisor to 30 students per year.
- Faculty advisor to Student Society of Health Systems Pharmacists chapter.
- Research interests: use of complementary medicine in treatment of chronic disease states, smoking cessation and electronic cigarette utilization, new and engaging teaching methods in pharmacy education.
- Precepted Advanced Pharmacy Practice Experience students in elective academia setting.

Adjunct Faculty, University of Florida Graduate Distance Programs
University of Florida, School of Pharmacy
January 2011-- May 2014

- Prepared distance education learning materials to be delivered via Adobe Connect and other platforms for on-line learning.
- Developed comprehensive test bank for students completing the on-line modules.
- Delivered lectures and exercises via distance education technology for Master's and Doctorate degree students in programs including Veterinary Medicine, Forensic Science, Pharmaceutical Chemistry, Regulatory Science, Drug Chemistry and Pharmacology.
- Enhanced learning by providing clinical cases and discussions.
- Met with students on-line in small group setting as well as large discussion groups.

- Student academic advisor.
- Led chat sessions, communicate via email.
- Graded assignments, tests and presentations.

Consulting/Dispensing Pharmacist PRN
United Healthcare, Lexington, SC
August 2010 - August 2012

- Performed patient medical chart reviews, clinical monitoring, and managed appropriate drug therapy in accordance with federal and state regulations.
- Evaluated physician medication orders regarding dosage, appropriateness of drug, potential interactions, stability and route of administration.
- Analyzed, retrospectively and prospectively, drug utilization for the institutional drug formulary maintenance.
- Reviewed and checked technician prepared orders for delivery and dispensing.
- Consulted with advanced practitioners, healthcare professionals and managers of pharmaceutical services to develop and implement best working practices.

Pharmacist PRN
Rite Aid Pharmacy, Columbia, SC
September 2010 – August 2012

- Performed pharmacist duties in a high volume retail setting, including dispensing, verifying orders and patient counselling.
- Provided immnunizations to patients as allowed according to SC state law.
- Performed MTM for patients when requested.
- Managed team of pharmacy technicians.

Hospital Pharmacy Student Intern
Lexington Medical Center, West Columbia, SC
June 2008 - May 2010

- Prepared IV compounded medications, interpreted and prepared orders per medications orders in CPOE.
- Ensured proper control and dispensing of narcotics.
- Interacted with clinical pharmacists, physicians, and nurses regarding drug therapy.
- Compounded a wide variety of specialty preparations including chemotherapy and TPN.

Retail Pharmacy Student Intern,
Rite Aid Pharmacy, Columbia, SC
September 2006 – May 2010

- Accurately interpreted, processed, and filled prescriptions.
- Effectively communicated with physicians' offices and insurance companies regarding patients' pharmacy needs.
- Counseled and answered patients' questions concerning their prescriptions, OTC medications, nutritional supplements, and herbal products.
- Assisted with appropriate recordkeeping to assure compliance with federal and state laws.
- Maintained pharmacy inventory and supplies.
- Provided excellent customer support and follow up.

Senior Pharmaceutical Formulation Scientist
Pfizer Inc., December 2004 – August 2006

- Worked with formulation team in determining of yields (actual and theoretical), performed batch production record verification, ingredient review, and conditional quality releases, all per company's SOPs (standard operating procedures) and following guidance of cGMPs.
- Performed OOS (Out-Of-Specifications) investigations and reported process deviations on products not meeting all quality criteria set by QC department (for example, content uniformity, particle size and other quality issues.)
- Collaborated with drug formulation research team in development of new products and their test methods, with focus on natural products, supplements, and vitamins.
- Assisted with development of new medication delivery system of liquid drug products (Licaps), assisting with taking the products through ANDA process.
- Developed and validated methods for analytical testing of raw materials and finished products for QC department to test for identity, purity and strength to meet quality standards set by FDA and USP.
- Assisted with improvements in stability studies, including utilizing USP 71 guidance in new products.
- Supported all activities involving new product transfers, compliance, testing and various manufacturing process validations.
- Authored, updated and edited SOPs for training of new employees, changes in process control as well as laboratory manuals, then trained personnel to assure proper understanding of the methodology and troubleshooting.
- Comfortable with regulatory environment as set by cGMPs per 21CFR 210 and 211, USP, BP, EP, ISO, ICH and FDA regulations.
- Assisted with management of five laboratory technician team.
- Certified emergency responder.

Senior Pharmaceutical Chemist
GlaxoSmithKline, May 1999 – December 2004

- Developed and managed reference standard program including creating guidelines for certification and qualification of new reference standards used by QA and QC departments.
- Participated in product transfers from one site to another, as well as new product roll out including ANDA process.
- Assisted with development of internal audit system and issuance of appropriate protocols to assure compliance with cGMPs, USP 797, ISO certifications, ICH and other FDA requirements as well as EPA and other environmental regulations.
- Conducted quality control testing of finished products (liquids, gels, solid dosage, and wet granulation products) and raw materials
- Extremely familiar with laboratory testing ranging from physical testing (friability, LOD, particle size, disintegration, extractions, dissolution testing, etc.) to wet chemistry analysis (titrations, KF, etc.).
- Specialized in more complex testing using advanced technology and instrumentation (GC, HPLC, TLC, NMR, FTIR, TOC, atomic analyzer, etc.)
- Monitored trending of stability studies.
- Very familiar with USP, BP, FDA and EP guidelines and methodology for pharmaceutical quality testing.
- Provided in-depth technical training of analysts, assisted with development of internal laboratory technician certification program.

CURRENT LICENSING AND CERTIFICATIONS

- Licensed Pharmacist in SC, license #13173
- Licensed Pharmacist in NC, license #21809
- Licensed Pharmacist in HI, license #3308
- American Pharmacist Association Pharmacy-Based Immunization Delivery Certificate 2010-present
- CITI Program IRB Members Basic Course
- ACLS Certification
- BLS Certification
- Certificate of completion from Pharmacy Compounding seminar at PCCA, Houston TX
- Certificate from Critical Point Sterile Compounding boot camp, Denver CO, October 2010
- Certified by American Technical Institute in method development using GC-MS, GC, and HPLC

OTHER PROFESSIONAL ACTIVITIES

Sterile Compounding Committee Volunteer Expert
SC Board of Pharmacy, Columbia SC
August 2019-present

- Provide expertise on sterile compounding practices to the Board of Pharmacy members to help with updating of the assessment forms for inspections of pharmacy facilities.
- Consult members of state legislature on options in regulatory areas of pharmacy practice, specifically in the area of compounding.

Expert Witness

- Area of expertise includes:
    - Sterile compounding per USP Chapter 797 and 503B regulations
    - Non-sterile compounding per USP Chapter 795 and 503B regulations
    - Pharmacy malpractice
    - Pharmacokinetics
    - Pharmaceutics
    - Pharmacology
    - USP chapter 797 and USP 800
    - Medication preparation and management
    - Bioequivalnce, appropriate drug substitutions, generic selection including generics in biologic preparations.
- Provide medicolegal consulting for state and federal court cases.
- Analyze evidence provided and consult the legal team with options for further actions.
- Prepare testimony statements, depositions, testify in court.

Lexington School District 1 Health Sciences Advisory Committee Member

- Provide guidance and recommendations on development of health and science related courses in the district's curriculum for high school students.

FACULTY APPOINTMENTS AND TEACHING EXPERIENCE

DIDACTIC TEACHING EXPERIENCE

Clinical Assistant Professor in Department of Clinical Pharmacy and Outcomes Sciences, University of South Carolina, Columbia SC
August 2013 to present

- PHMY 885: Pharmacy Law and Ethics (3 credit hours, course coordinator)
- PHMY 790: Pharmacy Skills Laboratory III: Introduction to Health-Systems Pharmacy I (1 credit laboratory course, course coordinator)
- PHMY 791: Pharmacy Skills Laboratory IV: Advanced Health System Pharmacy Practice (1 credit laboratory course, course coordinator)
- PHAR 401: Introduction to Pharmacy as a Profession
- PHMY 710: Biopharmaceutics, Pharmaceutics and Pharmacokinetics (3 credit hours)
- PHMY 999: Clinical Seminar
- PHMY 757: Independent Study

KPIC Master instructor, University of South Carolina, Columbia SC
August 2014 to March 2015

- Basic Aseptic Technique course, 23.5 hours of CE, Master instructor
- Advanced Aseptic Technique course 16 live hours of CE, Master instructor

Assistant Professor of Pharmacy
South University School of Pharmacy, Columbia SC,
May 2010 to August 2013

- PHA 4367 Integrated Sequence IV Autonomic Nervous System (Pharmacology and Pharmacotherapy lectures), 8 credit hours
- PHA 3159 Introduction to Integrated Sequence: Basic Pharmacology Modules, Medicinal Chemistry, 6 credit hours
- PHA 3107 Pharmaceutical Calculations (use of pre-recorded lectures and in-class hands-on exercises), 3 credit hours (course coordinator)
- PHA 3113 Pathophysiology I (topics include geriatrics, inflammation, cancer, HIV, immune response), 4 credit hours (course coordinator)
- PHA 3114 Pathophysiology II (topics include autonomic nervous system, wound healing, gout, RA), 4 credit hours
- PHA 3109 Microbiology and Immunology (lectures in immunology, virology), 5 credit hours
- PHA 5335 Animal Venoms and Poisons (developed and implemented this elective), 3 credit hours (course coordinator)
- PHA 5332 Applied Pharmaceutical Care II (topics including, OA, RA, BPH, ED), 4 credit hours
- PHA 4265 Integrated Sequence III Inflammation (Pharmacology and Pharmacotherapy of osteoarthritis, rheumatoid arthritis, gout, would healing, lupus), 6 credit hours
- PHA 3162 Integrated Sequence I: Introductory Pharmacology and Medicinal Chemistry, 5 credit hours
- PHA 4212 Pharmacokinetics I (Implemented team-based learning), 4 credit hours

- PHA 4228 Pharmacokinetics II (Implemented team-based learning), 4 credit hours
- PHA 3135 Integrated Pharmacy Skills Lab I, 3 credit hours
- PHA 3136 Integrated Pharmacy Skills Lab II, 3 credit hours
- PHA 3137 Integrated Pharmacy Skills Lab III, 3 credit hours
- PHA 4238 Integrated Pharmacy Skills Lab IV, 3 credit hours
- Longitudinal Pharmacy Practice Experiences I – V: PHA 3135, 3163, 4266, 4369, 5330, 1 credit hour, course coordinator

Adjunct Faculty, UFL Graduate Distance Programs
University of Florida, School of Pharmacy, January 2012—April 2016
- Medicinal Chemistry I
- Fundamentals of Medicinal Chemistry, course coordinator
- Herbal and Dietary Supplements

EXPERIENTIALTEACHING EXPERIENCE
Advanced Pharmacy Practice Experience (APPE) Elective INDUSTRY—University of South Carolina College of Pharmacy, Preceptor for PharmD students.

Advanced Pharmacy Practice Experience (APPE) Academic Rotation—South Carolina College of Pharmacy, Preceptor for PharmD students.

Advanced Pharmacy Practice Experience (APPE) Academic Rotation—South University School of Pharmacy, Preceptor for PharmD students.

COLLEGE OF PHARMACY COMITTEES
- South University SOP Curriculum Committee, member, chair 2013
- South University SOP Curriculum Subcommittee for Pharmaceutical Calculations course advisory member, 2010-2012
- South University SOP Committee for Professional Outreach, member 2011-2013
- South University SOP Technology Committee, member 2010-2013
- South University SOP ACPE Self-Study and Assessment Committee, member 2012-2013
- South University SOP Admissions Committee, member 2012-2013
- University of South Carolina COP Continuing Education Committee, member 2013-2016
- University of South Carolina COP Search Committee for Lab assistant, chair, 2014-2016
- University of South Carolina COP Curriculum Committee, member 2017-2019
- University of South Carolina COP Admissions Committee, member 2019-present

INVITED LECTURES AND PRESENTATIONS
Almgren M. CDB: Exploring Regulations, Trends and a Potential role in Opioid Epidemic. Annual Continuing Education Conference. Presented live April 21st, 2021.

Emelia Beam PharmD, Michaela Almgren, PharmD, MS. Update on COVID19 Vaccines. Nephron Pharmaceuticals, May 3, 2021.

Almgren, M., COVID-19 Prevention Myth vs. Fact: Assessment of Complementary Therapies as Preventative Measures for Safety and Efficacy. SCSHP Fall 2020 Meeting, Columbia, SC, October 2020.

2020 Immunization Update. 1.0 ACPE accredited CE presentation at Nephron Pharmaceuticals, October 2020.

COVID 19 Prevention: Myth versus Fact. 1.0 credit hour ACPE accredited presentation at Nephron Pharmaceuticals Inc., West Columbia, SC June 8th, 2020.

Update on COVID19 Vaccines. 1.0 credit hour ACPE accredited presentation at Nephron Pharmaceuticals Inc., West Columbia SC, May 3rd, 2021.

M. Almgren. My Path to Pharmacy. CAPPS USC student chapter speaker, February 4th, 2021.

USP Updates in Sterile Compounding. 1.0 credit hour ACPE accredited presentation at Nephron Pharmaceuticals Inc., West Columbia, SC, April 13th and 15th, 2020.

Multimodal Analgesia Basics. 1.0 credit hour ACPE accredited presentation at Nephron Pharmaceuticals Inc., West Columbia SC, April 1st and April 3rd, 2020.

COVID19—Separating Facts from Fiction. SC Palmetto Business Forum Quarterly Meeting in Columbia SC, March 9th, 2020.

New Approaches to Pain Management: Multimodal Opioid Free Analgesia. 1.0 credit hour ACPE accredited presentation at UofSC COP CE Conference, February 1st, 2020.

Medication Safety of Hazardous Drugs: Can We All Be Safe? 1.0 credit hour ACPE accredited CE presentation at SCSHP Fall Meeting in Columbia SC, October 17th 2018.

Review of Sterile Compounding per USP 797. 1.0 credit hour ACPE accredited CE presentation at SCSHP Fall Meeting in Columbia SC, October 17th 2018.

M. Almgren. Current Status and Future Trends in Sterile Compounding as Defined by USP Chapters 797 and 800. 1.0 ACPE Live CE accreditation awarded. SCSHP Annual Meeting March 11-13, 2018, Hilton Head Island, SC.

M. Almgren. Who wants to be a pharmacist? CAPPS USC student chapter speaker, April 11th, 2018.

M. Almgren. Importance of unification of performance protocols for CSTD testing per NIOSH. November 7, 2016, Cincinnati, OH. NIOSH Public Comment meeting, invited speaker.

M. Almgren. Important role of CSTD utilization in compounding of hazardous materials to enhance protection of the compounder. 2016 ASHP Midyear, Las Vegas. Hazardous Drug Task Force speaker for USP 800 implementation.

M. Almgren. Sterile Compounding and Implementation of USP Chapter 797: Where we came from, where we are and where we might be headed. 1.0 ACPE Live CE accreditation awarded. SCSHP Annual Meeting, March 2015, Hilton Head Island, SC.

M. Almgren. Pharmacy school pathways. CAPPS USC student chapter speaker, April 2015.

PEER-REVIEWED PUBLICATIONS

Almgren M., Cooper C., Maxwell W., Baker J. Instruction on compounded sterile preparations at U.S. schools of pharmacy—a ten year follow up study. American Journal of Health-System Pharmacy, Volume 75, Issue 12, 15 June 2018 Pages 845-847, https://doi.org/10.2146/ajhp170641

Textbook chapter: Khazan M., Phillips C., **Almgren M**. "Pharmaceutical Calculations" In: Sutton S. Scott. McGraw Hill's NAPLEX Review Guide. 3rd Edition, McGraw Hill 2018

Textbook chapter: **Almgren M**. "Sterile Compounding Regulations" In: Sutton S. Scott. *McGraw Hill's NAPLEX Review Guide*. 3rd Edition.

Karyn I. Cotta, Samit Shah, PhD, RPh, MBA, **Michaela M. Almgren**, PharmD, MS, Lilia Z. Macías-Moriarity, PhD, MPH, Vicky Mody. Effectiveness of flipped classroom instructional model in teaching pharmaceutical calculations. *Currents in Pharmacy Teaching and Learning*. 2016. Volume 8, Issue 5, Pages 646–653. https://doi.org/10.1016/j.cptl.2016.06.011

Braga S, **Almgren M**. Complementary Therapies in Cystic Fibrosis: nutritional supplements and herbal products. *Journal of Pharmacy Practice*. 2013 Feb;26(1):14-7.

Wynn W, **Almgren M**, Stroman R, Clark K. Pharmacist's Toolbox for Smoking Cessation. *Journal of Pharmacy Practice.* 2012 Dec;25(6):591-9.

POSTERS WITH ABSTRACTS

Petscavage Katie, PharmD Candidate; **Almgren Michaela, PharmD, MS**. Assessment of complementary therapies as preventive measures for COVID-19 for safety and efficacy. December 2020 ASHP Midyear Virtual Clinical Meeting. Poster #SP-243.

Aya Ahmed PharmD Candidate; **Michaela Almgren PharmD, MS**; Ryan McCormick PharmD Candidate; Carolyn McNamara PharmD Candidate; Robert Singleton PhD. Establishing a Coronavirus (COVID-19) Testing Lab in 40 Days. December 2020 ASHP Midyear Virtual Clinical Meeting.

Ryan McCormick PharmD Candidate; **Michaela Almgren, PharmD, MS**; Sarah Arnold PharmD Candidate, Madeline Dean PharmD Candidate, Marianna Vinson, PharmD Candidate. Process improvements and validation of a syringe-filling robot though collaboration between pharmacy and engineering student teams. December 2020 ASHP Midyear Virtual Clinical Meeting.

Alexis Caronis, PharmD Candidate 2021; **Michaela Almgren, PharmD, MS**; Samantha Lindeman, PharmD Candidate 2021; Kristen Kilby, PharmD Candidate 2021. Evaluation of medication safety effectiveness training in a workplace environment. 2020 APHA Annual Meeting, Baltimore MD, March 2020.

Caroline Hansen PharmD Candidate; **Michaela Almgren PharmD, MS**; Kristen Kilby PharmD Candidate; Alexis Caronis PharmD Candidate; Ryan McCormick PharmD Candidate; Benjamin Tabor PharmD Candidate. College of Pharmacy and School of Engineering Student Teams' collaboration to design pharmacy compounding system using robotic arm to perform aseptic syringe filling. 2020 SCSHP Annual Meeting, Charleston SC, March 2020.

Alexis Caronis, PharmD Candidate 2021; **Michaela Almgren, PharmD, MS**; Kristen Kilby, PharmD Candidate 2021; Caroline Hansen, PharmD Candidate 2021; Benjamin Tabor, PharmD Candidate 2021; Ryan McCormick, PharmD Candidate 2022. Development of the Masterflex L/S peristaltic pump process validation in a 503B outsourcing pharmacy. 2019 ASHP Midyear Clinical Meeting, Las Vegas, December 2019. Poster #3-445.

Ashton Holley, PharmD Candidate**; Michaela Almgren, PharmD, M.S.**; Normando Sandoval, PharmD Candidate; Priya Patel, PharmD Candidate; Xiaoxia Wang, PharmD Candidate; Lauren Moran, PharmD Candidate. Evaluation of cleaning effectiveness of 7.8% ionized hydrogen peroxide mist versus 7.8% hydrogen peroxide mist in a cleanroom environment. 2019 ASHP Midyear Clinical Meeting, Las Vegas, December 2019. Poster #3-449.

Caroline Hansen PharmD Candidate; **Michaela Almgren PharmD, MS**; Kristen Kilby PharmD Candidate; Alexis Caronis PharmD Candidate; Ryan McCormick PharmD Candidate; Benjamin Tabor PharmD Candidate. College of Pharmacy and School of Engineering Student Teams' collaboration to design pharmacy compounding system using robotic arm to perform aseptic syringe filling. 2019 ASHP Midyear Clinical Meeting, Las Vegas, December 2019. Poster #3-432.

Kristen Kilby PharmD Candidate**; Michaela Almgren PharmD, MS**; Alexis Caronis PharmD Candidate; Caroline Hansen PharmD Candidate; Ryan McCormick PharmD Candidate, Benjamin Tabor PharmD Candidate, Noah Smith MBA, PharmD Candidate**.** Performance comparison of the Baxter repeater pump and the Masterflex peristaltic pump using high flow tubing set L/S 24. 2019 ASHP Midyear Clinical Meeting, Las Vegas, December 2019. Poster #3-446.

Samantha Lindeman, PharmD Candidate 2021; **Michaela Almgren, PharmD, MS**; Alexis Caronis, PharmD Candidate 2021; Kristen Kilby, PharmD Candidate 2021; Noah Smith, Pharm D Candidate 2020; Caroline Hansen, PharmD Candidate 2021; Ashton Holley, PharmD Candidate 2021; Priya Patel, PharmD Candidate 2021. Evaluation of naloxone safety effectiveness training in a workplace environment. 2019 ASHP Midyear Clinical Meeting, Las Vegas, December 2019. Poster #3-440.

Tristan Gore, PharmD Candidate 2022. Noah Smith, PharmD Candidate 2020. Dana Nelson, PharmD Candidate 2020. **Michaela Almgren, PharmD, MS**. Incidence and clinical impact of particulate matter in injectable drug products. 2019 ASHP Midyear Clinical Meeting, Las Vegas, December 2019. Poster #3-422.

Almgren M, Maxwell W, Grant A, Hembree H, Shah A. Disability and Accommodations in Pharmacy Practice and Education. 2019 AACP Annual Meeting, Chicago 2019. Abstract #53.

Cooper C., **Almgren M.**, Maxwell W., Baker J. Instruction on compounded sterile preparations at US pharmacy schools. 2018 SCSHP Annual Meeting poster session, Hilton Head Island, SC.

Cooper C., **Almgren M**. Maxwell W., Baker J. Instruction on compounded sterile preparations at US pharmacy schools. Poster presentation at 2017 ASHP Midyear in Orlando, FL, poster # 368.

Parth Parikh, PharmD. Candidate; Paul Philavong, PharmD Candidate, Sam McCallum, PharmD Candidate, Nhung Nguyen, PharmD Candidate; **Michaela Almgren, PharmD, MS**. Assessing Microbial Growth Rates of Sterile Versus Non-Sterile Gloves Used During Sterile Compounding. 2017 SCSHP Annual Meeting Hilton Head, SC, poster session.

Cotta K, **Almgren M**. "Effectiveness of Blended Teaching Method for Pharmaceutical Calculations." Poster presentation at 2012 AACP Annual meeting in Kissimmee FL.

Almgren M., Clark K. "Laboratory Exercise to Enhance Integration and Application of Basic Sciences to Pharmacy Practice in Students." Poster presentation at 2012 AACP Annual meeting in Kissimmee FL.

Peer Review/Editorial Boards/Editorships for Journals

Reviewer for Currents in Pharmacy Teaching and Learning.
Reviewed: Book review of the Handbook on Injectable Drugs

Reviewer for AJHP
Reviewed: Commentary: Impact of revised USP 797 guidance and how we might mitigate risk: A real-world example

Reviewer for AJHP
Reviewed: Third Consensus Development Conference on the Safety of Intravenous Drug Delivery Systems – 2018

Peer Reviewer for The Joint Commission Journal on Quality and Patient Safety
Reviewer and member of editorial board of Alternative Medicine Studies Journal
Reviewer for Journal of Dietary Supplements
Reviewer for Natural Standard Research Collaboration
Reviewer for Currents in Pharmacy Teaching and Learning
Reviewer for AACP Annual Meeting Research/Education Abstracts for Poster Session

PROFESSIONAL AFFILIATIONS

American Pharmacist Association (APhA), 2006-present
American Society of Consultant Pharmacists (ASCP), 2008-2013

American Society of Health-System Pharmacists (ASHP), 2008-present
- Pain management SIG 2011-2013

SC Pharmacist Association (SCPhA), member 2006-present
- Professional Affairs committee 2010-2011, 2017-2018
- Legislative Affairs Committee 2011-2012

SC Society of Health Systems Pharmacists member (SCSHP) 2008-present
- Education Committee 2014-2016
- Professional Affairs Committee 2015-2016
- Legislative Committee 2017-2018

American Association of College of Pharmacy (AACP), member 2010-present
- AACP Pharmacy Practice Strategic Plan, Bylaws, and Resolutions Committee member 2018-2020
- Member of the Scholarship Committee of the Curriculum SIG for AACP 2018-2020
- AACP Audit Committee member 2018-2020
- House of Delegates representative for USC College of Pharmacy 2017-2018
- AACP Pharmacy Practice Strategic Plan, Bylaws, and Resolutions Committee member 2018-2019
- Lyman Award Committee Member 2012-2013

Parenteral Drug Association Member (PDA) 2019-2020